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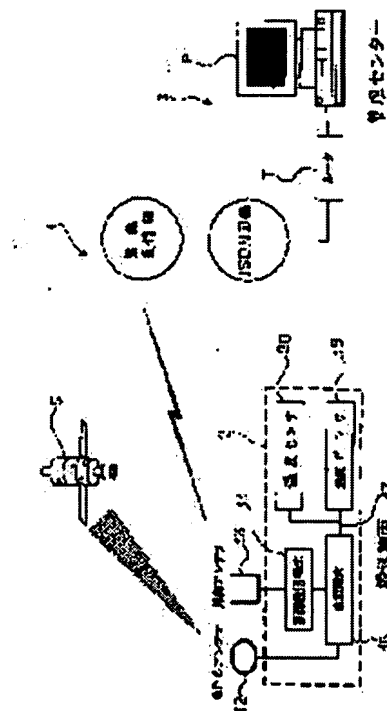
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(54) PHYSICAL DISTRIBUTION MANAGING SYSTEM

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a physical distribution managing system capable of surely and smoothly controlling a temperature of articles to be carried.

SOLUTION: This physical distribution managing system is provided with a storing means for storing the information on a movable body relating to a carrying vehicle 2 loading articles to be carried, a GPS 13 producing the positional information relating to a position of the carrying vehicle 2, temperature sensors 19, 20 producing the temperature information relating to a temperature of the articles to be carried, and an on-vehicle terminal 16 having a function for sending and receiving the data to the external by means of the radio-communication, on the carrying vehicle 2, and the information on the movable body, the positional information and the temperature information are output to the external by the radio-communication.



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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the system which manages PD, such as food transportation from a place of production to a commercial scene, or food transportation from a delivery center to other delivery grounds.

[0002]

[Description of the Prior Art] Although transport and delivery of the food refrigerated or frozen are activating by the advance of a low-temperature physical distribution system in recent years, it is actual that attention was not paid even about the temperature change of the food under conveyance etc. until now. Therefore, when it will be thawed while conveying frozen foods, for example with the reefer, and it was frozen again after that, it was difficult to grasp it subsequently.

[0003] Moreover, bacterial infection by food is made into the problem in recent years, and importance has come to be attached also to temperature management of the food under starting conveyance. On the other hand, temperature management of food is made important [temperature and time amount] like the case of a space food etc. (HACCP (Hazard Analysis Critical Con-trol Point) method developed by NASA).

[0004]

[Problem(s) to be Solved by the Invention] Then, if the temperature change under conveyance of such food can be supervised, it will become possible to prevent beforehand the damage generated during conveyance, or to control to the minimum. Moreover, if the current position of the food under conveyance can be grasped simultaneously in that case, while management will become easy, it will become advantageous to the analysis of investigation of a cause etc.

[0005] Then, this invention is accomplished in order to solve the starting Prior-art-technical problem, and the physical distribution management system which can perform temperature management of a conveyance article exactly and smoothly is offered.

[0006]

[Means for Solving the Problem] The physical distribution management system of this invention prepares in a mobile a storage means memorize the mobile information about the mobile in which a conveyance article is carried, a means generate the positional information about the location of a mobile, a means generate the temperature information about the temperature of a conveyance article, and the control means equipped with the function which transmits and receives data by radiocommunication between the exteriors, and it makes a control means output these mobile information, positional information, and temperature information outside by radiocommunication.

[0007] The physical distribution management system of invention of claim 2 is characterized by mobile information being identifiable information about the origin, the destination, conveyance article, and the mobile itself of a mobile at least in the above.

[0008] The physical distribution management system of invention of claim 3 is characterized by a control means recording positional information and temperature information on a storage means in the

above.

[0009] The physical distribution management system of invention of claim 4 is characterized by a control means transmitting periodically mobile information, positional information, and temperature information to a management pin center, large in the above.

[0010] The physical distribution management system of invention of claim 5 is characterized by a control means transmitting mobile information, positional information, and temperature information to said management pin center, large according to the data demand from a management pin center, large in the above.

[0011] The physical distribution management system of invention of claim 6 is characterized by performing a predetermined alarm output in a mobile while it notifies a management pin center, large, when data concerning [on the above and / a control means] abnormal temperature to temperature information are contained.

[0012] The physical distribution management system of invention of claim 7 is characterized by a control means outputting in a mobile the information transmitted from the management pin center, large in the above.

[0013] The mobile information about the mobile in which a conveyance article is carried according to the physical distribution management system of this invention, Since it is constituted so that the control means in which the positional information about the location of a mobile and the temperature information about the temperature of a conveyance article were prepared by the mobile may output outside by radiocommunication These information is periodically transmitted to a management pin center, large like claim 4. Like claim 5, by carrying out a data demand from a management pin center, large, the mobile information, positional information, and temperature information from this mobile can be received, and the temperature and the conveyance situation of the article currently conveyed by the mobile concerned can be managed now in the management pin center, large.

[0014] Namely, if it is made to output in a mobile the information transmitted from the management pin center, large like claim 7 while notifying a management pin center, large like claim 6 when abnormalities have arisen, for example to the temperature of an article, and being made to perform an alarm output predetermined in a mobile, according to a report, a management pin center, large to the solution concerned which receives unusually will be transmitted to a mobile, and it can also output now.

[0015] Therefore, when authorized personnel, such as a driver, have ridden with the mobile, generating of the starting abnormalities can be recognized exactly and suitable management can be given based on the information from a management pin center, large. Since positional information can also be especially grasped in the management pin center, large, directing the nearby base for performing repair etc. can also raise the temperature management ability of a conveyance article remarkably generally, such as becoming possible.

[0016] If positional information and temperature information are especially recorded on the storage means of a mobile like claim 3, analyzing minutely will also become [under what kind of temperature management the article was conveyed by what kind of mobile, and] possible by reading the information which starts after arriving at the destination.

[0017] Moreover, in claim 5, only the data demand from a management pin center, large is made to perform transmission from a mobile, except it, it bundles up at the destination and it also becomes possible to reduce remarkably a method, then communication link cost, such as to perform a communication link from a mobile.

[0018]

[Embodiment of the Invention] Hereafter, based on a drawing, the operation gestalt of this invention is explained in full detail. Drawing 1 shows the block diagram of the food space transportation system 1 as an example which applies this invention, and drawing 2 shows the transport gestalt of the food by the food space transportation system 1, and the food temperature under transport. In addition, in this application, it is dealt with with conveyance as a concept which includes both transport and delivery.

[0019] The food transportation system 1 of an example is built from the management pin center, large 3 of the express company to which the conveyance car 2 which consists of the refrigeration and the

refrigerated truck as an example of a mobile, and the conveyance car 2 concerned belong etc. And these conveyances car 2 and the management pin center, large 3 are constituted so that data may be transmitted and received through the radiocommunication network 4 and a public line ISDN.

[0020] And in the above-mentioned management pin center, large 3, monitor operation of the conveyance car 2 is performed, and a personal computer P is installed, for example, it connects with the public line ISDN with Router T.

[0021] On the other hand, the conveyance car 2 is equipped with the cold storage 8 and the freezer compartment 9 which were constituted by a driver's stand 6 and the back pallet 7 for the driver who becomes authorized personnel to operate the conveyance car concerned. In addition, while the engine which is not illustrated under the driver's stand 6 is prepared, the refrigerator which cools cold storage 8 and a freezer compartment 9 to predetermined refrigeration temperature (for example, +5 degrees C - +10 degrees C) and frozen temperature (for example, -20 degrees C - -10 degrees C), respectively and which is not illustrated shall be carried in the pallet 7.

[0022] Moreover, while the mounted terminal 16 and the radiocommunication terminal 11 which consist of PDA and a mobile terminal are carried in the driver's stand 6 of this conveyance car 2, the GPS antenna 12 and the external antenna 13 for radiocommunication are attached in the roof part.

[0023] Furthermore, in cold storage 8 and a freezer compartment 9, temperature sensors 19 and 20 are attached, respectively. And while these temperature sensors 19 and 20 are connected to the signal line 17 wired by the conveyance car 2 through a coupler, this signal line 17 is connected to the mounted terminal 16.

[0024] The configuration of the above-mentioned mounted terminal 16 is shown in drawing 3. The mounted terminal 16 consists of memory 32 as a storage means which consists of CPU (microcomputer) 31 used as a control means, a flash memory, etc., an I/O interface 33, a bus I/O interface 34 as a transceiver means, etc. Moreover, the indicator 37 with a loudspeaker which consisted of color LCD displays etc., the switch (a bar code reader etc. is included) 38 as an input means, GPS14, etc. are formed in the mounted terminal 16.

[0025] Moreover, said signal line 17 is connected to said bus I/O interface 34, and transfer of said temperature sensors 19 and 20 and data is performed through this signal line 17. The control program for performing data communication using the software and the radiocommunication terminal 11 for identifying the predetermined communications protocol and predetermined temperature sensors 19 and 20 for performing said temperature sensors 19 and 20 and data communication etc. is set to the memory 32 of the mounted terminal 16. Furthermore, the operation facilities code which specifies the conveyance car 2 with which the mounted terminal 16 concerned was carried in memory 32 (ID code of the conveyance car 2.) Mobile information is written in.

[0026] And while said indicator 37, GPS14, a switch 38, and the radiocommunication terminal 11 are connected to the I/O interface 33, said GPS antenna 12 is connected to GPS14, and said external antenna 13 is connected to the radiocommunication terminal 11.

[0027] On the other hand, said temperature sensor 19 (the same is said of a temperature sensor 20) As shown in a detail at drawing 4, a control section 61 and the memory 62 as a storage means, The I/O interface 63 as a transceiver means and a storage means, and the sensor section 64 as a detection means, It consists of the TH register 66, the tangent line register 67, the setting-out register 68 that determines a condition, a CRC generator 69 which takes communicative consistency, the power-source detection section 71 which detects a Vcc power source, a capacitor 72, diodes 73 and 73 which constitute an accumulation-of-electricity means, etc.

[0028] In this case, a capacitor 72 is connected to the output side of diode 73, and the input terminal 76 is connected to this diode 73 and the I/O interface 63. And an input terminal 76 is connected to a signal line 17, and a capacitor 72 is connected also to the I/O interface 63. In addition, data are made by the potential (high potential) of +5V, and the pulse signal which consists of 0V (low voltage), and it is sent to the above-mentioned signal line 17.

[0029] And if a temperature sensor 19 is connected to a signal line 17, while the pulse signal of the high potential which constitutes data, and low voltage serves as high potential, feed will accomplish for each

component as it is, and a capacitor 72 will also charge. And while being low voltage, it discharges from a capacitor 72, and it considers as the configuration with which the power source of each component is provided.

[0030] In addition, the Vcc (DC+5V) power supply terminal 77 is also formed in a temperature sensor 19, and it connects with diode 74, and if a temperature sensor 19 connects this Vcc power supply terminal 77 to a power-source line, each component is constituted so that it can operate also by feed from a power-source line (current supply mode). That is, without filling up a capacitor 72 in this current supply mode, since each component comes to operate, when the temperature sensors 19 at the time of inspection etc. want to operate promptly, its convenience improves.

[0031] Moreover, if a control section 61 is directed from the mounted terminal 16 with the I/O interface 63 so that it may mention later, it will detect the temperature in cold storage 8 (the case of a temperature sensor 20 freezer compartment 9) by the sensor section 64, will incorporate the temperature data, will once make a note of it, and will be written in 62. In that case, when the temperature which the sensor section 64 detected is over said alarm upper limit temperature TH, or when less than the alarm minimum temperature tangent line, the data about an elevated-temperature alarm and a low-temperature alarm are also written in memory 62. And if it is polled from the mounted terminal 16 with the I/O interface 63 so that it may mention later, the temperature data written in memory 62 and the data about an alarm will be transmitted to the mounted terminal 16 with the I/O interface 63.

[0032] Here, the discernment data of the purport which is the ID code and sensor of temperature sensor 19 the very thing are written in the I/O interface 63, the alarm upper limit temperature TH of cold storage 8 (a temperature sensor 20 freezer compartment 9) is written in the TH register 66, and the alarm minimum temperature tangent line is written in the tangent line register 67. The data of such alarm upper limit temperature TH and the alarm minimum temperature tangent line are transmitted through a signal line 17 from the mounted terminal 16.

[0033] Moreover, the communications protocol for performing data communication between the mounted terminals 16 in memory 62 etc. is memorized. Moreover, when failure has arisen in the temperature sensor 19, the fault data concerned is also written in memory 62, and is transmitted to the mounted terminal 16. Moreover, the temperature sensor 19 has the self-hold function to hold a current condition, also when the communication link between the mounted terminals 16 is cut off.

[0034] Next, actuation is explained, referring to drawing 2 next with the above configuration. The refrigerated food and frozen foods which are conveyance articles, respectively are loaded [on the pallet 7 of the conveyance car 2] into cold storage 8 and a freezer compartment 9 in the origin A of drawing 2 . Moreover, document data, such as the driver (authorized personnel) name, Origin A, the course grounds B and C and Destination D which operate the name of article and quantity of these refrigerated food and frozen foods (identification information), and the conveyance car 2 concerned, and an arrival predetermined time to them, are beforehand registered into the personal computer P of the management pin center, large 3 by the driver in Origin A corresponding to said operation facilities code.

[0035] The document data in this case are inputted using the switches (bar code reader etc.) of the mounted terminal 16, and are written in the end memory 32. And the document data with which CPU31 was written in memory 32 by predetermined transmitting actuation, and an operation facilities code are transmitted with a packet method using the radiocommunication terminal 11. A personal computer P receives and holds the document data and the operation facilities code which start through a radiocommunication network, a public line ISDN, and Router T.

[0036] Moreover, while a refrigerator cools each cold storage 8 and a freezer compartment 9 to predetermined temperature and refrigerates or freezes the above-mentioned food, the conveyance car 2 leaves Origin A. CPU31 transmits [the ID code of said temperature sensors 19 and 20 is written in the memory 32 of the mounted terminal 16, and] and receives data among each temperature sensors 19 and 20 using each ID code.

[0037] That is, the mounted terminal 16 polls a fixed period (it is 1 etc. time etc. in 1 second) to temperature sensors 19 and 20. In this case, the mounted terminal 16 transmits a communication link initiation command. The mounted terminal 16 is setting to "H" the port where the signal line 17 was

connected at the usual state, and transmission of this communication link initiation command is performed by setting a port to 500 microseconds - 960 microseconds (microsecond) "L." And the mounted terminal 16 stands by for 15 microseconds to 60 microseconds. A signal line 17 is "H" in the meantime.

[0038] Then, the O.K. command is answered from temperature sensors 19 and 20. Transmission of this O.K. command is performed by setting an input terminal 76 to 60 microseconds - 240 microseconds "L." And the standby of the mounted terminal 16 is carried out for 100ms (ms). A signal line 17 is "H", for each component of temperature sensors 19 and 20, feed accomplishes from an input terminal 76, and a capacitor 72 is charged in the meantime.

[0039] Then, the mounted terminal 16 transmits the above-mentioned ID code of the call command of a temperature sensor 19, and a temperature sensor 19. Next, the mounted terminal 16 transmits a thermometry initiation command (directions of detection actuation initiation) to a temperature sensor 19. Then, the standby of the mounted terminal 16 is carried out for 500ms (ms). A signal line 17 is "H", for each component of a temperature sensor 19, feed accomplishes from an input terminal 76, and a capacitor 72 is charged in the meantime.

[0040] Temperature is measured by the sensor section 64 (detection), and the control section 61 of a temperature sensor 19 stores the measured temperature data in memory 62, if the above-mentioned thermometry initiation command is received through the I/O interface 63. And if the waiting period for the 500 above-mentionedms passes, as for the mounted terminal 16, a communication link initiation command will be transmitted again, and the O.K. command will be answered from a temperature sensor 19. Next, the mounted terminal 16 transmits the above-mentioned ID code of the call command of a temperature sensor 19, and a temperature sensor 19.

[0041] And a memory call command is transmitted. The control section 61 of a temperature sensor 19 answers a letter in the temperature data stored in memory 62 like the above-mentioned in response to this command, and the data about said alarm. And finally, the mounted terminal 16 transmits a reset command and the O.K. command is answered from a temperature sensor 19. In addition, also in the case of a temperature sensor 20, it is the same, and the ID code of the temperature sensor 20 concerned is used in that case.

[0042] CPU31 of the mounted terminal 16 makes a note of the temperature data (the data about an alarm may be contained) which carried out in this way and were collected from temperature sensors 19 and 20, and writes them in 32. Moreover, GPS14 of the mounted terminal 16 generates once the location data (positional information) of the conveyance car 2 which consists of the lat/long of the current position in 1 second corresponding to the polling to at any time or said temperature sensors 19 and 20 by receiving the electric wave from the satellite S for GPS with the GPS antenna 12. CPU31 also writes this location data in memory 32.

[0043] In addition, such temperature data and location data correspond to time of day by CPU31, and are recorded and held again at memory 32. Thereby, this recorded data can be read behind and it can analyze now using an operation facilities code (conveyance food, an origin, and the destination can be pinpointed).

[0044] Moreover, CPU31 of the mounted terminal 16 displays the temperature data collected from temperature sensors 19 and 20 with a drop 37. Thereby, a driver can check serially the temperature in each present cold storage 8 and a freezer compartment 9 by the driver's stand 6.

[0045] Furthermore, CPU31 of the mounted terminal 16 carries out wireless transmission of the radiocommunication terminal 11, the temperature data (the data about an alarm are also contained) currently written in memory 32 using the external antenna 13, and the location data in the management pin center, large 3 by the packet method like the above-mentioned with an operation facilities code. A personal computer P receives and holds the temperature data and location data corresponding to the operation facilities code which starts through a radiocommunication network, a public line ISDN, and Router T.

[0046] Moreover, in the management pin center, large 3, it can poll on the conveyance car 2 through Router T, a public line ISDN, and a radiocommunication network by operating a personal computer P at

any time (data demand). The mounted terminal 16 will transmit the temperature data and location data which are written in memory 32 to a personal computer P with an operation facilities code using the radiocommunication terminal 11 and the external antenna 13 at the event, if the polling which starts from a personal computer P is received. A personal computer P receives the temperature data and location data corresponding to the operation facilities code which starts through a radiocommunication network, a public line ISDN, and Router T, and holds them similarly.

[0047] Thereby, conveyance situations, such as temperature (the temperature of receipt food is substantially represented from the temperature of cold storage 8 or a freezer compartment 9) of the food currently conveyed with the conveyance car 2 concerned in the management pin center, large 3 and the current position of the conveyance car 2 concerned, can be managed now on real time.

[0048] And if the conveyance car 2 should arrive at the course ground C through the course ground B, the temperature of a freezer compartment 9 should rise as by having opened the door of a pallet 7 there for a long time showed to the lower berth of drawing 2, and alarm upper limit temperature should be exceeded at time of day P1, the data about the starting alarm will be collected from a temperature sensor 20 with the mounted terminal 16 like the above-mentioned.

[0049] When the data about an alarm are contained in the data received from the temperature data 20, CPU31 of the mounted terminal 16 performs an alarm display (in this case, it becomes the display of an elevated-temperature alarm) to an indicator 37 first, and carries out singing of said buzzer. Thereby, a driver can recognize the abnormality elevated temperature of a freezer compartment 9, and can take the measures of closing a door now immediately.

[0050] Moreover, when the data about an alarm are contained in the data which received CPU31 of the mounted terminal 16 from the temperature data 20 when starting, the radiocommunication terminal 11 and the external antenna 13 are used in 10 minutes irrespective of 1 time of timing, and wireless transmission of the temperature data (the data about an alarm are contained) concerned and the location data is promptly carried out in the management pin center, large 3 with an operation facilities code. A personal computer P receives the temperature data (the data about an alarm are contained) and location data corresponding to the operation facilities code which starts through a radiocommunication network, a public line ISDN, and Router T like the above-mentioned.

[0051] Thereby, the location of the conveyance car 2 concerned can be promptly grasped as the temperature of the freezer compartment 9 of the conveyance car 2 serving as an abnormality elevated temperature also in the management pin center, large 3. The directions data of the purport [and] which closes "door on the conveyance car 2 through Router T, a public line ISDN, and a radiocommunication network by operating a personal computer P" can be transmitted. If the directions data applied from a personal computer P are received, CPU31 of the mounted terminal 16 will be displayed on an indicator 37, and will carry out singing of the buzzer similarly.

[0052] Here, when [which is not unusual] based on disconnection of a mere door, judging from the data about the starting alarm, namely, when judged as failure of a refrigerator, a nearby base will be searched with the management pin center, large 3 from the location data of the current conveyance car 2, and the directions data of a purport which drop in there will be transmitted to the mounted terminal 16 with a personal computer P. This can cope with the abnormalities which need repair and inspection promptly, and damage of conveyance food can be suppressed now to prevention or the minimum.

[0053] Moreover, since the current position of the mounted car 2 can be grasped in the personal computer P of the management pin center, large 3 at any time (it is usually 1 time in 10 minutes), when the time of arrival to the course grounds B and C or Destination D is late, for example, an inquiry to that effect can also be performed to a driver (in this case, a cellular phone etc. will be used).

[0054] In addition, although it was made to carry out wireless transmission of each data in 10 minutes in the personal computer P of the management pin center, large 3 from the mounted terminal 16 once in the above-mentioned example, you may make it transmit the data in memory 32 to a personal computer P collectively, when it arrives not only at it but at the destination. In that case, communication link cost can be reduced now as compared with the above-mentioned example. However, it is not necessary to say that it can poll from a personal computer P to the mounted terminal 16 at any time during conveyance

like the above-mentioned also in such a case.

[0055] Moreover, although temperature sensors 19 and 20 generated the data about an alarm in the example when the temperature of a freezer compartment 9 or the temperature of cold storage 8 exceeded alarm upper limit temperature or it was less than minimum temperature, it judges having reached the temperature before resulting not only in it but in each upper limit temperature and minimum temperature (elapsed time may be added to decision), and you may make it generate the warning data of abnormality precognition.

[0056] Furthermore, although the example explained taking the case of conveyance cars, such as refrigeration and a refrigerated truck, as a mobile, this invention is effective not only the truck applied as a mobile but when conveying food by the electric car or the aircraft. Moreover, not only the independence operation means that starts as a mobile but the container of shipment etc. is included. However, when a successive range crosses extensively, a satellite telephone network etc. will be used as a radiocommunication network.

[0057]

[Effect of the Invention] The mobile information about the mobile in which a conveyance article is carried according to the physical distribution management system of this invention as explained in full detail above, Since it is constituted so that the control means in which the positional information about the location of a mobile and the temperature information about the temperature of a conveyance article were prepared by the mobile may output outside by radiocommunication These information is periodically transmitted to a management pin center,large like claim 4. Like claim 5, by carrying out a data demand from a management pin center,large, the mobile information, positional information, and temperature information from this mobile can be received, and the temperature and the conveyance situation of the article currently conveyed by the mobile concerned can be managed now in the management pin center,large.

[0058] Namely, if it is made to output in a mobile the information transmitted from the management pin center,large like claim 7 while notifying a management pin center,large like claim 6 when abnormalities have arisen, for example to the temperature of an article, and being made to perform an alarm output predetermined in a mobile, according to a report, a management pin center,large to the solution concerned which receives unusually will be transmitted to a mobile, and it can also output now.

[0059] Therefore, when authorized personnel, such as a driver, have ridden with the mobile, generating of the starting abnormalities can be recognized exactly and suitable management can be given based on the information from a management pin center,large. Since positional information can also be especially grasped in the management pin center,large, directing the nearby base for performing repair etc. can also raise the temperature management ability of a conveyance article remarkably generally, such as becoming possible.

[0060] If positional information and temperature information are especially recorded on the storage means of a mobile like claim 3, analyzing minutely will also become [under what kind of temperature management the article was conveyed by what kind of mobile, and] possible by reading the information which starts after arriving at the destination.

[0061] Moreover, in claim 5, only the data demand from a management pin center,large is made to perform transmission from a mobile, except it, it bundles up at the destination and it also becomes possible to reduce remarkably a method, then communication link cost, such as to perform a communication link from a mobile.

[Translation done.]